

AUTHORS: Ipat'yev, V.V., Professor (Deceased) and  
Zheltukhin, D.V., Engineer SOV/129-58-12-8/12

TITLE: Oxidation of Nickel in Sulphurous Gas at Elevated  
Temperatures (Okisleniye nikelya v sernistom gaze pri  
vysokikh temperaturakh)

PERIODICAL: Metallovedeniye i Obrabotka Metallov, 1958, Nr 12,  
pp 42 - 45 + 1 plate (USSR)

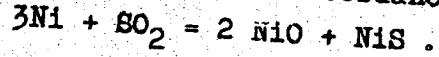
ABSTRACT: Little data has been published in literature on the  
oxidation of nickel and its alloys with sulphurous gas  
at elevated temperatures. According to Hatfield, W.H., "J.Iron  
Steel Inst.", Vol 115, 1927 (Ref 1), the effect of sul-  
phurous gas on pure nickel is strongly dependent on the  
temperature. According to his opinion, nickel is  
intensively disrupted by sulphurous gases at 800 °C; the  
effect is less at 900 °C and ceases almost completely at  
1 000 °C. The investigations of Hatfield were of a  
comparative nature and he did not consider the kinetics of  
oxidation of nickel in sulphurous gas. In this paper,  
the author presents the results of investigation of the  
kinetics of oxidation of nickel in sulphurous gas at  
elevated temperatures and also data on the phase and  
chemical compositions of the scale. The oxidation speed

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Oxidation of Nickel in Sulphurous Gas at Elevated Temperatures

was determined by periodic weighing of the specimen (99.7% Ni, 0.002% S) which was located in a pure sulphurous gas. The oxidation of the nickel was effected at the temperatures 600, 700 and 800 °C. Figure 3 (plate) shows microphotos of the scale produced by oxidation at 600, 700 and 800 °C, respectively. In Figure 4 (plate) an X-ray diffraction picture obtained for the case of oxidation of nickel in sulphurous gas at 700 °C is reproduced. The following conclusions are arrived at: oxidation of nickel in sulphurous gas complies with the parabolic law in the temperature range 600 to 800 °C; the constant of scale formation depends, to a considerable extent, on the temperature and has a maximum value at 800 °C; the speed of oxidation of nickel in the sulphurous gas is considerably higher than its speed of oxidation in air; the scale obtained on nickel in the case of an atmosphere of sulphurous gas consists of the two phases NiO and NiS; apparently, oxidation of nickel in the sulphurous gas proceeds in accordance with the relation:



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Oxidation of Nickel in Sulphurous Gas at Elevated Temperatures  
SOV/129-58-12-8/12  
There are 2 figures and 3 tables and 5 references, 1 of  
which is English and 4 Soviet.

ASSOCIATION: Leningradskaya lesotekhnicheskaya akademiya  
imeni S.M. Kirova (Leningrad Forestry Academy)  
imeni S.M. Kirov)

Card 3/3

ZHELTUKHIN, G., inshener.

Mechanical cleaning and testing of gas cylinders of compressed-gas  
automobiles. Avt.transp. 34 no.9:16-17 S '56. (MLRA 9:11)

1. Nachal'kik Stalinskoy stantsii tekhnicheskogo obslushivaniya  
gazoballonykh avtomobiley.  
(Automobiles--Engines (Compressed gas))

ZHILITUKHIN, I.I.

Reconstruction of Soviet District of the capital.  
31 no.6:8-11 Je '57. Gor.khoz,Mosk.  
(MIRA 10:?)

1. Predsedatel' ispolkoma Sovetskogo raysoveta.  
(Moscow--City planning)

ACCESSION NR: AP4022661

S/0207/64/000/001/0121/0123

AUTHOR: Zheltukhin, N. A. (Novosibirsk)

TITLE: Stability of elementary thermohydrodynamic systems

SOURCE: Zhurnal priklad. mekhan. i tekhn. fiz., no. 1, 1964, 121-123

TOPIC TAGS: thermohydrodynamics, heat transfer, mass transfer, combustion, thermo-hydrodynamic stability

ABSTRACT: A thermohydrodynamic system in the form of a duct with variable cross section is considered. A gas undergoes various processes: heat transfer, combustion, mass transfer, etc. These processes, together with the variable cross section, are called influences on the system. The influences are called concentrated if they occur in a sufficiently small portion of the duct. It is then possible to replace this portion by one possessing abrupt changes in the parameters of the system. The case of three concentrated influences is considered first. The perturbation equations, given with reference to B. V. Raushenbakh (Vibratsionnoye gorenije. Fizmatgiz, 1961), are:

$$\text{Card } 1/2 \quad \frac{\partial v_i}{\partial \tau} + M_i \frac{\partial v_i}{\partial \xi} + \frac{\partial p_i}{\partial \xi} = 0, \quad \frac{\partial p_i}{\partial \tau} + M_i \frac{\partial p_i}{\partial \xi} + \frac{\partial \sigma_i}{\partial \xi} = 0, \quad \frac{\partial \sigma_i}{\partial \tau} + M_i \frac{\partial \sigma_i}{\partial \xi} = 0 \quad (1)$$

ACCESSION NR: AP4022661

where  $\gamma$  is the time,  $\xi$  the coordinate,  $v$  the velocity,  $p$  the pressure,  $s$  the entropy, and  $M$  the Mach number. General solutions to the equations are given. The introduction of boundary conditions produces a system of equations which may be unstable. Next, the case of two concentrated influences is discussed. Necessary and sufficient conditions for stability are obtained. Finally, the case of three concentrated influences is discussed where the entropy wave may be disregarded. Necessary and sufficient conditions for stability are again obtained. Orig. art. has: 29 equations.

ASSOCIATION: none

SUBMITTED: 12Aug63

DATE ACQ: 08Apr64

ENCL: 00

SUB CODE: PH

NO REF Sov: 002

OTHER: 000

Card 2/2

"APPROVED FOR RELEASE: 03/15/2001

CIA-RDP86-00513R002064710010-0

POPUGAYLO, V.M.; KLEPKO, G.D.; ZHELTUKHIN, P.A.

Group outbreak of Z fever in a meat combine; clinical epidemiological observation. Zhur.mikrobiol., epid. i immun. 33 no.4:65-67 Ap '62.

1. Iz Voronezhskogo meditsinskogo instituta.

(MIRA 15:10)

(Q FEVER)  
(PACKING HOUSE WORKERS--DISEASES AND HYGIENE)

APPROVED FOR RELEASE: 03/15/2001

CIA-RDP86-00513R002064710010-0"

ZHELTUKHIN, P.V., inzh.; LYUTIN, M.F., inzh.; KOVRIGIN, Ye.N., inzh.

Forest management machines. Trakt. i sol'khozmash. no.7:36-37 J1 '64.

1. Gosudarstvennoye spetsial'noye konstruktorskoye byuro po proyektirovaniyu  
lesokhozyaystvennykh mashin Volgo-Vyatskogo soveta narodnogo khozyaystva,  
(MIRA 18:7)

KARIMOV, Z.K.; NOGOVITSINA, P.S.; ZHELTUKHIN, Ye.N.

Age related structure of viral hepatitis (Botkin's disease)  
morbidity. Zhur. mikrobiol., epid. i immun. 40 no.4:136-139  
Ap '63.  
(MIRA 17:5)

1. Iz I Moskovskogo ordena Lenina meditsinskogo instituta imeni  
Sechenova i Tul'skoy gorodskoy sanitarno-epidemiologicheskoy  
stantsi.

KARIMOV, Z.K.; NOGOVITSINA, P.S.; ZHELTUKHIN, Ye.N.

Seasonal nature of viral hepatitis (Botkin's disease).  
Zhur. mikrobiol., epid. i immun. 33 no.11:140-143 N '62.

1. Iz 1-go Moskovskogo ordena Lenina meditsinskogo instituta.  
imeni Sechenova i Tul'skoy gorodskoy sanitarno-epidemiologicheskoy stantsii.

(MIRA 17:1)

SOLODOVNIKOV, Yu.P.; ZHELTUKHIN, Ye.N.; NOGOVITSINA, P.S.

Typhoid fever in Tula during the period 1887-1962. Zhur.mikrobiol.,  
epid. i immun. 42 no. 2:37-41 F '65. (MIRA 19:6)

1. I Moskovskiy ordena Lenina meditsinskij institut imeni Sechenova  
i Tul'skaya gorodskaya sanitarno-epidemiologicheskaya stantsiya.

USSR/Pharmacology. Toxicology. Various Preparations V  
Abs Jour : Ref Zhur-Biol., No 8, 1958, 37648  
Author : Zheltukhina D. V.  
Inst : Not given  
Title : Coniferous Chlorophyl-carotine Ointment (Khvo-  
ynaya khlorofillo-karotinovaya pasta)  
Orig Pub : Priroda, 1957, No 7, 112

Abstract : No abstract

Card 1/1

ZALUKAYEV, L.P.; ZHELTUKHINA, T.I.

Reduction of dihydroquinoline by formic acid. Izv. vys. ucheb.  
zav., khim. i khim. tekhn. 6 no.3:521-522 '63. (MIRA 16:8)

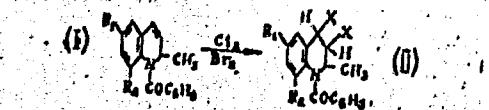
1. Voronezhskiy gosudarstvennyy universitet i Voronezhskiy  
sel'skokhozyaystvennyy institut.  
(Quinoline) (Formic acid)

ACC NR AP6034209 (A,N) SOURCE CODE: UR/0153/66/009/004/0681/0682  
AUTHOR: Zalukayev, L. P.; Zheltukhina, T. I.  
ORG: Department of Organic Chemistry, Voronezh Agricultural Institute  
(Kafedra organicheskoy khimii, Voronezhskiy sel'skokhozyaystvennyy  
institut)  
TITLE: Reactions of halogens with N-benzoyl derivatives of 1,2-hydroquinolines  
SOURCE: IVUZ. Khimiya i khimicheskaya tekhnologiya, v. 9, no. 4, 1966,  
681-682  
TOPIC TAGS: hydroquinoline, acylated hydroquinoline, halogenation, of  
~~acetylated hydroquinoline~~ halogenated organic compound  
ABSTRACT: Halogenation of acylated derivatives of 1,2-hydroquinolines  
Ia and Ib in carbon tetrachloride solution yielded the dihalogen deriva-  
tives III (mp 153—154°C, yield 56%); IIb (mp 127—128°C, yield 60%);  
IIc (mp 146—147°C, yield 82%); and IID (mp 134—135°C, yield 85%);

Card 1/3

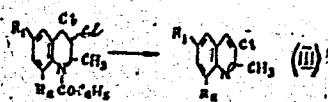
UDC: 547.831.4

ACC NR: AP 6034209



Ia R<sub>1</sub> = CH<sub>3</sub>; R<sub>2</sub> = H.  
 Ib R<sub>1</sub> = R<sub>2</sub> = CH<sub>3</sub>.  
 IIa R<sub>1</sub> = CH<sub>3</sub>; R<sub>2</sub> = H; X = Cl.  
 IIb R<sub>1</sub> = R<sub>2</sub> = CH<sub>3</sub>; X = Cl.  
 IIc R<sub>1</sub> = CH<sub>3</sub>; R<sub>2</sub> = H; X = Br.  
 IId R<sub>1</sub> = R<sub>2</sub> = CH<sub>3</sub>; X = Br.

On boiling with dilute sulfuric acid the dihalogen derivatives are converted into the 3-chloroderivatives IIIa (mp 83—84°C, yield 51%) and IIIb (mp 67—68°C, yield 45%):



IIIa R<sub>1</sub> = CH<sub>3</sub>; R<sub>2</sub> = H.  
 IIIb R<sub>1</sub> = R<sub>2</sub> = CH<sub>3</sub>.

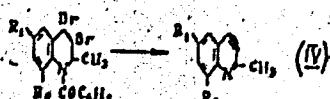
On boiling with diluted sulfuric acid the dibromo derivatives undergo transformation into quinoline bases IVa (mp 58—59°C) and IVb (mp 46 to 47°C):

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CIA-RDP86-00513R002064710010-0

ACC-NR: AP6034209



IVa  $R_1 = \text{CH}_3; R_2 = \text{H}$   
IVb  $R_1 = R_2 = \text{CH}_3$

[W.A. 50]

SUB CODE: 07 / SUBM DATE: 27Nov64 / ORIG REF: 001 / OTH REF: 001

Card 3/3

APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R002064710010-0"

ZALUKAYEV, L.P.; ZHELTUKHINA, T.I.

Synthesis of N-benzoyl derivatives of 1,2-dihydroquinolines.  
Dokl. AN SSSR 153 no.3:592-593 N '63. (MIRA 17:1)

1. Voronezhskiy gosudarstvennyy universitet i Voronezhskiy  
sel'skokhozyaystvennyy institut. Predstavлено akademikom  
M.I. Kabachnikom.

ZALUKAYEV, L.P.; ZHELTUKHINA, T.I.

Structure of a dimer of 2,2,4-trimethyl-1,2-dihydroquinoline.  
Izv.vys.ucheb.zav.;khim.i khim.tekh. 5 no.2:277-279 '62.

1. Voronezhskiy gosudarstvennyy universitet i Voronezhskiy  
sel'skokhozyaystvennyy institut.

(Quinoline)

(MIRA 15:8)

ZHELTUKHOV, G.I.; GOL'TSOV, V.S.

Our methods in servicing automatic equipment in railroad stations. Avtom., telem. i sviaz' 9 no.3:29-31 Mr '65.

(MIRA 18:11)

1. 7 umestitel' nachal'nika Omskoy distantsii Zapadno-Sibirskoy dorogi (for Zheltukhov). 2. Starshiy inzh. Omskoy distantsii Zapadno-Sibirskoy dorogi (for Gol'tsov).

ZHELEVSKIY, V. V., KATASONOV, N. S. and FABRIKANT, Yu. V. (The Trans-Carpathian Oblast' Veterinary Bacteriological Laboratory, Ukrainian SSR). (Abstracted by V. A. ALIKAYEV)

"Improving the technique of determining carotene in blood sera."..  
Veterinariya, vol. 39, no. 2, February 1962 pp. 78

FOMIN, D.Kh.; ZHELTVAJ, A.A.

Virus strains isolated from the gastric contents of patients  
with epidemic hepatitis. Vop.med.virus. no.9:36-40 '64.

1. Nauchno-issledovatel'skiy institut epidemiologii, mikrobiologii  
i gigiyeny, Uzhgorod. (MIRA 18:4)

ZHELEVAY, A.V.

Semiautomatic control of a hydraulic gluing press. Der.prom.  
4 no.11:25 N '55.  
(MIRA 9:2)

1.Uzhgorodskiy fanerno-mebel'nyy kombinat.  
(Uzhgorod--Furniture industry) (Woodworking machinery)

ZHELEVAY, A.V., inzhener.

Quality of SB6-5G smoothing planers. Der.prom. 5 no.2:26 F '56.  
(MLRA 9:5)

1. Uzhgorodskiy fanerno-mebel'nyy kombinat.  
(Planing machines)

ZHELTWAY, A.V.

Wages based on finished production in the furniture factories  
of "Zakarpates" Trust. Bum.i der.prom. no.4149-50 O-D '62.

(U) DRA 15:12)

(Wages—Furniture industry)

ZHILIVAY, A.V., inzhener.

Two-position copying lathe. Der.prem.4 no.10:22 0 '55. (MLRA 9:1)

1.Ushgorodskiy fanerno-mebel'nyy kombinat.  
(Ushgorod--Lathes)

ZHELTVAY, V. V.

"Raillietiniasis of Chickens in Zakarpatskaya Oblast." Cand Vet Sci,  
Leningrad Veterinary Inst, Leningrad, 1953. (RZhBiol, No 8, Dec 54)

Survey of Scientific and Technical Dissertations Defended at USSR Higher  
Educational Institutions (12)  
SO: Sum. No. 556, 24 Jun 55

ZHELTVAY, V.V.

Classification of the phages of Flexner's *Bacterium dysenteriae*.  
Mikrobiol. zhur. 26 no.3:54-59 '64. (MIRA 18:5)

I. Uzhgorodskiy nauchno-issledovatel'skiy institut epidemiologii,  
mikrobiologii i gigiyeny.

EVLIYA, Chelebi [Evliya, Efendi]; ZHELYAKOV, A.D.; TVERTINOVA, A.S. [translator]; VEKILOV, A.P. [translator]; GARBUZOVA, V.S. [translator]; GRIGOR'YEV, A.P. [translator]; ZYRIN, A.A. [translator]; IVANOVA, R.D. [translator]; IVANOV, S.N. [translator] Prinimali uchastiye: KYAMILEV, Kh. [translator]; MASHTAKOVA, Ye.I. [translator]; GRUNINA, E.A., red. izd-va; KUZ'MIN, I.F., tekhn. red.

[A travel book (excerpts from the work of a 17th century Turkish traveler); translation and commentary] Kniga puteshestviia (izvlecheniya iz sochineniya turetskogo puteshestvennika XVII veka); perrevod i kommentarii. Moskva, Izd-vo vostochnoi lit-ry. (Pamiatniki literatury narodov Vostoka: Perevody, no.6) No.1. [Moldavia and the Ukraine] Zemli Moldavii i Ukrayiny. 1961. 337 p.

(MIRA 14:12)

1. Vostochnyy fakul'tet Leningradskogo Gosudarstvennogo universiteta (for all except Kyamilev, Mashtakova, Grunina, Kuz'min).
2. Institut narodov Azii AN SSSR (for Kyamilev, Mashtakova).  
(Elviya, Efendi, ca. 1611- ca. 1682)  
(Moldavia--Description and travel)  
(Ukraine--Description and travel)

ANDRYUSHCHENKO, Nikolay Petrovich; ZHELTYSHEV, Vasiliy Pavlovich;  
ZHEREBKOV, I.V., red.; ABRAMOVA, Ye.A., tekhn.red.

[Working with a coping saw] Vypilivanie lobzikom. Rostov-na-  
Donu. Rostovskoe knizhnoe izd-vo, 1959. 24 p. (MIRA 13:3)  
(Handicraft) (Jig saw)

ZHELTISHEV, P. I.

ZHELTISHEV, P. I. - "Examination and selection of the working parts of cultivators for inter-row cultivation of row crops on peat-bog soils in Poles'ye". Kiev, 1955. Min Higher Education USSR. Ukrainian Order of Labor Red Banner Agricultural Academy, Chair of Agricultural Machinery. (Dissertation for the Degree of Candidate of Technical Science.)

SO: Knizhnaya Letopis', No. 13, 22 October 1955. Moscow

ACC NR. APT000013

(A)

SOURCE CODE: UR/0130/00/000 012/0020/0022

AUTHOR: Frenkel', R. Sh.; Bagrova, N. M.; Zheltyshhev, Yu. G.; Vinogradov, N. N.

ORG: Volga Branch, Scientific Research Institute of the Rubber Industry (Volzhskiy filial nauchno-issledovatel'skogo instituta rezinovoy promyshlennosti)

TITLE: Study of the reinforcement of rubbers with various fibers

SOURCE: Kauchuk i rezina, no. 12, 1966, 20-22

TOPIC TAGS: reinforced rubber, filler, natural rubber, synthetic fiber

ABSTRACT: A study has been made of the reinforcement of rubbers with fibers and of the effect of various fibers on the properties of rubber vulcanizates. The study was undertaken for the purpose of preparing substitutes for fabric-reinforced rubbers whose production technology is of some complexity. The experiments were conducted with natural, butadiene-styrene (SKS-30 ARM-15), nitrile (SKN-26), or polychloroprene (Nairit) rubbers, and with natural (flax, cotton) or synthetic (polycaprolactam, dacron, viscose) 30 mm fiber strands. The adhesion of the synthetic fibers to the rubbers was improved by impregnation of the fibers with adhesive compositions. Caprolactam fibers required preliminary treatment with a 20% NaOH solution at 75C. Rubber-fiber mixtures were prepared on preheated mills. Other [unspecified] ingredients were added under the usual conditions. The mixtures, containing 100 parts rubber, 60 parts fiber, and in most instances, 30 parts carbon black, were

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UDC: 678.4/.7:678.046.76

ACC NR: AP7000913

vulcanized at 143°C for 40 min. The properties of the vulcanizates with and without carbon black were investigated. Carbon black did not improve the properties of the vulcanizates, but carbon black of any type proved to be a necessary ingredient [reason unspecified]. Fiber-and-carbon-black-reinforced vulcanizates had high resistance to thermal aging and creep, satisfactory elasticity, and high tear-resistance. The best reinforcing properties were exhibited by caprolactam fibers impregnated with a mixture of carboxylated polybutadiene (SKD-1) latex (dry matter content, 20%) and a 40% solution of resorcinol-formaldehyde resin. Heat treatment of Nairit vulcanizates yielded products with the following properties: tensile strength, 500 kg/cm<sup>2</sup>; elongation, 50%; residual elongation, 2%. It is concluded that the good properties of fiber-and-carbon-black-reinforced vulcanizates are favorable to the expansion of their use in industry as eventual substitutes for fabric-reinforced rubber products, such as tires, conveyor belts or hoses. Orig. art. has: 1 figure and 3 tables.

SUB CODE: 11, 07/ SUBM DATE: 22Jul65/ ORIG REF: 001/ OTH REF: 001/ ATD PRESS: 5108

Card 2/2

TAHLE, Yevgeniy Viktorovich; PAYEVSKAYA, A.V.; CHERNOV, A.G.; ZHELUBOVSKAYA,  
E.A., red.toma; GUSEVA, K.A., red.izd-va; SHEVCHENKO, O.E.,  
tekhn.red.

[Works in twelve volumes] Sochineniya v dvenadtsati tomakh.  
Moskva, Izd-vo Akad.nauk SSSR. Vol.6. 1959. 814 p. (MIRA 12:2)  
(France--Labor and laboring classes)

ZHELUBOVSKAYA, K.V.; LADYSHKINA, T.Ye.

Results of palynological and diatomic analyses of  
Quaternary sediments in the northern part of Archangel  
Province. Sov.geol. 5 no.6:126-129 Je '62. (MIRA 15:11)  
(Archangel Province—Glaciology)

ZHELUBOVSKAYA, K.V.; LADYSHKINA, T.Ye.

Studying the late glacial history of the Baltic area on the basis  
of diatomic and palynologic investigations of a cross section of  
the Lakhta trough. Dokl. AN SSSR 146 no.6:1383-1385 O '62.

(MIRA 15:10)

1. Predstavлено академиком V.N. Sukachevым.  
(Lakhta region (Leningrad Province)--Paleobotany, Stratigraphic)

"APPROVED FOR RELEASE: 03/15/2001

CIA-RDP86-00513R002064710010-0

AYNEMER, A.I.; ZHELUBOVSKAYA, N.Ya.; LIKHACHEVA, A.A.; SAPENSON, E.I.

Stratigraphic division and lithological characteristics of a  
section of a structural-profile well, drilled at the Cheshme  
hills (central Lower Karz Kum). Trudy VSEGEI 109:302-319 '63.  
(MIRA 17:7)

APPROVED FOR RELEASE: 03/15/2001

CIA-RDP86-00513R002064710010-0"

USSR

0

Abs Jour : Ref Zhur - Biologiya, No 22, 1958, No 99545  
Author : Zhelubovskaya, N. V.  
Inst : Leningrad State Pedagogical Institute im.A.I.Gertsen.  
Title : Investigations of the Syamozero Expedition of the Chair  
of Zoology of 1955. Parasitic Fauna of the Gastro In-  
testinal Tract of the Ruff in Lake Syamozero  
Orig Pub : Uch.zap.Leningr.gos.ped.in-ta im.A.I.Gertsen, 1958,  
143, 394-399.  
Abstract : 25 ruffs from Lake Syamozero (Karelian ASSR) were investi-  
gated. Intestinal parasites were found in 13 fish. These  
were Camallanus truncatus, Acanthocephalus lucii,  
Raphidascaris acus and pleurocercoides Diphyllobothrium  
latum. In all, 12 species of parasites were found in the  
ruffs of Syamozero. Remark of the reviewer: Assignment  
of pleurocercoides D. latum to parasites of the gastro-  
intestinal tract is incorrect. The title of the article  
is inappropriate.--O.N.Bauer.

Card 1/1

ZHELUBOVSKAYA, N. V.

Quaternary volcanoes in Mongolia. Inv. AM 8888. Ser. geog. no. 5:50-59  
8-0 '58. (MIRA 11:12)  
(Mongolia--Volcanoes)

AUTHOR:

Zhelubovskiy, Yu.S.

SOV/10-58-5-8/28

TITLE:

Quaternary Volcanoes in Mongolia (Chetvertichnye vulkany  
Mongoliya)

PERIODICAL:

Izvestiya Akademii nauk SSSR - Seriya geograficheskaya,  
1958, Nr 5, pp 50-57 (USSR)

ABSTRACT:

A large area of Quaternary volcanoes exists in Central Asia. The article mentions existing literature on volcanoes in the Dari zanga and Khangay regions and presents a detailed description of such Quaternary volcanoes situated in these regions and other parts of eastern and south-eastern Mongolia, based on investigations carried out by the author from 1941 - 47. Quaternary volcanism can be assumed as a continuation of volcanic activity in the Tertiary and Mesozoic periods. Some Central-Asiatic volcanoes are not definitely extinct and it can be expected that they might resume their activity because of an increased seismicity

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Quaternary Volcanoes in Mongolia

SOV/10-58-5-8/28

in these regions.  
There are 2 maps, 2 diagrams and 22 references, 19 of which  
are Soviet and 3 English.

Card 2/2

Sov/210

## PARIS I BOOK INFORMATION

F1 (0); 2(0); 2(10)

Atomnaya energiya v vremya i tekhnika sotnykh let  
 (Atomic Energy in Aviation and Rocket Engineering). Collection  
 of Articles. Moscow. Izd-vo M-va Obor. SSSR. 1959. 500 p.  
 (Scientific-Material-Publishing House). No. of copies printed  
 not given.

Ed. - Compiler: P.T. Antonenkov. Engineer, Lt.-Colonel Ed.: Ya. M.  
 Todor; Tech. Ed.: A.R. Gavrilov.

Report: This book is intended for officers of the Soviet Armed Forces, members of society, and the general reader interested in the uses of atomic energy and in the development of aviation and rocket engineering. This collection of 46 articles, compiled by 20 Soviet scientists and based chiefly on Soviet material, discusses various aspects of the use of atomic energy in aviation and rocket engineering. The book surveys the development of atomic and thermonuclear weapons and space carriers. It gives the principles of atomic defense and explains the application of nuclear energy in aviation and rocketry. Fuel and construction materials, as well as actual physical and technological processes involved, are treated briefly. Fundamentals of atomic warfare and combat techniques are discussed at some length. The book is divided into four parts, of which the last consists chiefly of anti-Western propaganda. Section I is devoted to nuclear weapons and their use in aviation. Section II is on anti-atomic defense, especially the defense and destruction of airfields and aircraft, and defense against radiation. Section III is on the uses of nuclear energy in modern aircraft and rocket technology and flight techniques, including some speculations on space travel and on the survey of the future. There are 126 figures and 35 non-Soviet references (some in Russian translation).

Table of contents:

Egorov, A. [Lt. Colonel]. "Radiation Warfare Substances" 189
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card 5/9

(5)

ZHELUBOVSKAYA, K.V.; LADYSHKINA, T.Ye.

Post-glacial history of the Baltic region based on data of diatom  
and palynological studies of a section of the Lakhtinskiy trough.  
Dokl. AN SSSR 151 no.3:652-654 Jl '63. (MIRA 16:9)

1. Pyatoye geologicheskoye upravleniye Ministerstva geologii  
i okhrany nedr SSSR, Leningrad. Predstavлено академиком V.N.  
Sukachevym.

(Lakhtinskiy region—Diatoms)  
(Lakhtinskiy region—Palynology)

ZHELUBOVSKAYA, K.V.; BRAYNINA, B.I.

Separation method for the removal of microfauna from Quaternary rocks using heavy medium PD-3. Palaeont. zhur. no.4, 101-103 '64.  
(MIRA 18:3)

1. Pyatnoye geologicheskoye upravleniye Gosudarstvennogo geologicheskogo komiteta SSSR.

ZHELUDOV, A. N. Cand Chem Sci -- (diss) "Petroleums of Southern Timan.  
-40-

(Conditions and character of their conversion). Voronezh, 1957.

22 pp 20 cm. (Inst of Petroleum, Acad Sci USSR). 100 copies.

(KL, 22-57, 104)

-4-

ZHELUDIEV, I. S.

PA 242T51

USSR/Electronics - Electron Optics Jun 52

"Reflection of Filaments and Other Metallic Surfaces by an Emissive Electron Microscope of High Resolving Power," G. V. Spivak and I. S. Zheludev, Chair of Electron Optics

"Vest Moskov U, Ser Fiz, Mat, i Yest Nauk" No 4, pp 29-31

Author studies with aid of emissive electron microscope the migration of thorium on the surface of tungsten and observes the structure of threads of metals with high melting point. Considers the performance of the instrument satisfactory. Received 14 Dec 51.

242T51

SPIVAK, G. V., ZHELUDEV, I. S.

Electron Microscope

Reflection of threads and other metallic surfaces by an emission electron microscope of high resolving power. Vest. Mosk. un. no. 6, 1952.

9. Monthly List of Russian Accessions, Library of Congress, December 1952, Uncl.  
2

2HELODEV, I. S.

Dissertation: "Dielectric and Piezoelectric Properties of Heterogeneous Systems Containing Barium Titanate." Cand Phys-Math Sci, Inst of Crystallography, Acad Sci USSR, 28 Apr 54. (Vechernyay Moskva,--Moscow, Apr 54)

SO: SUM 243, 19 Oct 1954

"APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R002064710010-0

APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R002064710010-0"

USSR/ Physics - Piezoelectricity

FD-1042

Card 1/1 : Pub. 153 - 13/23

Author : Zheludev, I. S.

Title : Excitation of flexural oscillations of metallic plates by means of polycrystalline barium titanate

Periodical : Zhur. tekhn. fiz., 24, 1467-1473, Aug 1954

Abstract : Describes a method of excitation that enables one to study the oscillations of plates and membranes of various shapes. Notes that it is also possible to obtain the flexural oscillations of bimorphic barium-titanate plates by exciting two plates of barium titanate glued together; here the direction of polarization in the glued plates must be opposite in sign. Thank A. V. Shubnikov, Corr-Mem, Acad. Sci. USSR, for his guidance and also I. M. S. I'vestrova, I. B. Ogiyevich, and V. F. Parvov for their help. Nine references, 5 USSR (B. M. Vul (discoverer of piezoelectric barium titanate), I. M. Gol'dman, 1945; G. A. Smolenskiy, N. V. Kozhevnikova, 1951; A. V. Rzhanov, 1949; V. P. Konstantinova, A. V. Shubnikov, 1951).

Institution : --

Submitted : 13 June 1953

SHUBNIKOV, A.V., akademik; ZHELUDOV, I.S.; KONSTANTINOVA, V.P.;  
SIL'VESTROVA, I.M.; TOLKACHEV, S.S., redaktor; AROMS, R.A.  
tekhnicheskiy redaktor.

[Research on piezoelectric crystal patterns] Issledovanie  
p'ezoelektricheskikh tekstur. Moskva, Izd-vo Akademii nauk  
SSSR, 1955. 188 p.  
(Piezoelectricity) (MLRA 8:9)

"APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R002064710010-0

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APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R002064710010-0"

ZHELUDEV, I.S.

New research in piezoelectricity; meeting in the Institute of  
Crystallography. Vest.AN SSSR 25 no.9:97-98 S '55.  
(Piezoelectricity) (MIRA 8:12)

Zheludev, I.S.

Category : USSR/Electricity - Dielectrics

G-2

Abs Jour : Ref Zhur - Fizika, No 1, 1957 № 1512

Author : Zheludev, I.S.

Inst : Institute of Crystallography, Academy of Sciences USSR  
Title : Dielectric Ellipsoids and Dielectric-Constant Surfaces

Orig Pub : Kristallografiya, 1956, 1, № 1, 105-111

Abstract : The author proposes a method for the analysis of the polarization of anisotropic media, and a method for interpretation of the dielectric constant tensor ( $\Sigma$ ), suitable for dielectrics in which the electric field intensity ( $E$ ) and the polarization ( $P$ ) are linearly related. The geometric interpretation of the tensor  $\Sigma$  and of its reciprocal tensor lead to the Fresnel ellipsoid and to the ellipsoid of the indices. By characterizing the anisotropic dielectric with the aid of these ellipsoids, it is possible, given one of the specified vectors (D, E or P) to determine graphically the other two. In analogy with optics, the author introduces the concept of the radial (in the direction of the specified vector E) and normal (in the direction of the specified vector D) values of  $\Sigma$ . A method is given for plotting their surfaces. In the case of an anisotropic body the  $\Sigma$  surfaces are doubled surfaces. The method considered for the interpretation of the electric polarization can be extended to other phenomena, describable by symmetrical tensors of the second rank.

ZHELUDOV, I. S. and MAKAROV, V.M. Inst of Crystallography, AS USSR and Central Sci  
Res. Inst. Fire Prevention.

"Measurement of Pressures in Explosions of Gaseous Mixtures"  
Kristallografiya, Vol №3, 1956, pp 370-372

Translation W-31990, 28 Nov 1956

ZHELUDOV, I.S.; PARVOV, V.P.

Phase transitions and domain structures in barium titanate at temperatures of 120°C and 5°C. Kristallografiia 1 no.4:482-483 '56.  
(MIRA 10:1).

1. Institut kristallografi Akademii nauk SSSR.  
(Barium titanates) (Chrystallography)

ZHELUDEV,I.S., SHUVALOV,L.A.

"Seignettelectric Phase Transitions and the Symmetry of Crystals," by I. S. Zheludev and L. A. Shuvalov, Institute of Crystallography, Academy of Sciences USSR, Kristallografiya, Vol 1, No 6, Nov/Dec 56, pp 681-688

Changes in the morphological symmetry of all classes of crystals during seignettelectric phase transitions are considered and the relationships pertaining thereto derived.

SUM.1287

ZHELUDEV,I.S., SIT'KO, R.YA.

"The Behavior of Domains of Seignette Salt in Alternating Electric Fields," by I. S. Zheludev and R. Ya. Sit'ko, Institute of Crystallography, Academy of Sciences USSR, Kristallografiya, Vol 1, No 6, Nov/Dec 56, pp 689-691

On the basis of individual frames of motion pictures, the behavior of the domains of Seignette salt in alternating electric fields with a potential gradient of 50 volts per centimeter has been studied at frequencies of 32 and 1,000 cycles. The hysteresis of the reorientation of domains in alternating fields was investigated.

G-3

ZHELUDEV, I.S.  
USSR/Electricity - Semiconductors

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 12140

Author : Zheludev, I.S., Shuvalov, L.A.

Inst Title : Concerning the Symmetry and Physical Properties of a  
Polydomain Crystal of Rochelle Salt.

Orig Pub : Tr. In-ta kristallogr. AN SSSR, 1956, vyp. 12, 59-66

Abstract : The author considers the symmetry of the physical properties of Rochelle salt. The transition of Rochelle salt from rhombic into monoclinic during polymorphic transformation at the upper Curie point is explained from the point of view of the formal theory of symmetry. In the analysis of the physical properties of a polydomain crystal of Rochelle salt, it is concluded that the polydomain crystal of Rochelle salt, being monoclinic, has the same summary (macroscopic) physical properties in the interval between the Curie points as the single crystal of rhombic

Card 1/2

USSR/Electricity - Semiconductors

G-3

Abs Jour : Ref Zhur - Fizika, No 5, 1957, 12140

Rochelle salt, outside the ferroelectric region. Consequently, the tensors of the elastic and piezoelectric constants, and also the tensors of the dielectric constants, are written in the same form as for the rhombic Rochelle salt. This conclusion, however, must be applied with care. The authors indicate many limitations in its application.

Card 2/2

ZHELUDOV, I.S., OGIEVICH, I.B.

Piezoelectric instrument for measuring pressures and stresses in  
periodically operating mechanisms. Trudy Inst.Krist.no.12:200-204  
'56.  
(MIRA 10:2)

1. Institut kristallografii Akademii nauk SSSR.  
(Oscillators, Crystal)

ZHELUDEV, I.S.

USSR / Electricity

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9653

Author : Zheludev, I.S., Yurin, V.A.

Inst : Institute of Crystallography, Academy of Sciences USSR

Title : Certain Physical Properties of Rochelle Salt Crystals Subjected to Radioactive Radiation.

Orig Pub : Izv. AN SSR, ser. fiz., 1956, 20, No 2, 211-214

Abstract : An anomalous polarization P was observed in an X-cut of Rochelle salt (I) measuring 20 x 10 x 1.5 mm after exposure by means of a  $\text{Co}^{60}$  compound (irradiation dose amounted to approximately  $10^5$  roentgen/hour). As the time of exposure increased the curve of the hysteresis narrows down at small values of field intensity up to the formation of sections with linear polarization. After prolonged exposure, I polarizes like a linear dielectric. An investigation was made of the influence of a dc bias field E on the shape of

Card : 1/2

USSR / Electricity

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9653

Abstract : the anomalous hysteresis loop. Increasing E deforms one of the branches of the loops until it vanishes fully at  $E = E_a$  ( $E_a$  is the amplitude value of the alternating field). Further increase in E distorts the second branch of the hysteresis loop. When  $E \geq E_a$  the dependence of P on E becomes linear. It was established that the domain structure of irradiated I is retained even at large exposure times. Prolonged exposure produces a large number of damages to the crystalline structure of I, but does not change the value of the piezo-constant. It is proposed that the anomalous polarization of I, subjected to exposure, is due to the damage of a portion of the molecules of I, to a loss of the spontaneous P on the part of a portion of the elementary cells, to the appearance of transition layers between the domains, and also to atomic or ionic inclusions within the limit of a single domain.

Card : 2/2

ZHELUDOV, I.S., kandidat fiziko-matematicheskikh nauk; SHUVALOV, L.A.;  
SHUBNIKOV, A.V., akademik, otvetstvennyy redaktor; SHEPTAL', N.N.,  
doktor geologo-mineralogicheskikh nauk, otvetstvennyy redaktor;  
KUZNETSOVA, Ye.B., redaktor izdatel'stva; POLYAKOVA, T.V.,  
tekhnicheskiy redaktor

[Crystal growth; reports at the First Conference on the Growth of  
Crystals (March 5-10, 1956)] Rost kristallov; doklady na pervom  
soveshchanii po rostu kristallov (5-10 marta 1956 g.). Moskva,  
1957. 374 p. (MLRA 10:8)

1. Akademiya nauk SSSR. Institut kristallografi.  
(Crystallization)

ZHOLUDEV, I. S.

The National Committee for Crystallography of the USSR

"The Symmetry of Homogenous Isotropic Mediums in Tensor And Vector Fields" (Section 16-4) a paper submitted at the General Assembly and International Congress of Crystallography, 10-19 Jul 57, Montreal, Canada.

C-3,800,189

ZHELUDOV, I.S.

Symmetry and piezoelectric properties of crystals and textures.  
Kristallografia 2 no.1:89-98 '57. (MIRA 10:7)

1. Institut kristallografi Akademii nauk SSSR.  
(Crystals--Electric properties)

ZHELUDEV, I.S.

AUTHOR: Zheludev, I.S.

70-2-2/24

TITLE: The symmetry of scalars, vectors and tensors of the second rank. (Simmetriya skalyarov, vektorov i tenzorov vtorogo ranga)

PERIODICAL: "Kristallografiya" (Crystallography), 1957, Vol.2, No.2, pp. 207-216 (U.S.S.R.)

ABSTRACT: The symmetry of tensors up to the second rank can be represented geometrically by the point group notation. Combinations of two different types of tensor may give a symmetry different from either. The 17 groups found were:  
scalar  $\infty/\infty.m$ ; pseudoscalar  $\infty/\infty$ ; polar vector  $\infty.m$ ;  
axial vector  $\infty:m$ ; polar tensor  $m.\infty:m$  and  $m.2:m$ ; axial tensor  $\infty:2$ ,  $2:2$  and  $4.m$ ; combination of polar tensor and axial vector  $2:m$  and  $2$ ; combination of axial tensor and polar vector  $\infty$ ,  $2$ ,  $1$ ,  $2.m$  and  $m$ ; combination of axial tensor and axial vector  $4$ .

Card 1/1 Acknowledgments to Acad. A.V. Shubnikov. There are 3 Slavic references, 1 figure and 4 tables.

ASSOCIATION: Institute of Crystallography, Ac.Sc.USSR.  
(Institut Kristallografii AN SSSR)

SUBMITTED: January 21, 1957.

AVAILABLE: Library of Congress

ZHELUDEV, I.S.

70-3-3/20

AUTHOR: Zheludev, I.S.

TITLE: The symmetry of homogeneous continuous isotropic media in tensor, vector and scalar fields. (Simmetriya odnorodnykh nepreryvnykh izotropnykh sred v tenzornykh, vektornykh i skalyarnykh poljakh)

PERIODICAL: "Kristallografiya" (Crystallography), 1957,  
Vol. 2, No. 3, pp. 334 - 339 (U.S.S.R.)

ABSTRACT: In describing a number of physical phenomena in crystals, there is no necessity to consider their lattice structure and, in such cases, the crystal can be considered as a uniform continuous medium. In addition to crystalline substances, there are numerous amorphous substances which do not have a lattice structure (paraffin, resins, etc); of the various amorphous media, the author considers only those which are microscopically isotropic in the absence of external forces. In this paper, the author determines seventeen point groups of symmetry of homogeneous, continuous isotropic media which are obtained for the case when they are in the fields described by polar and axial tensors of the second order. In the here described sense, continuous isotropic media can be solid, liquid or gaseous.

There are 1 figure, 1 table and 3 Slavic references.

~~C-4-1/2~~ Inst. Crystallography, AS USSR

Zheludev, I.S.

70-5-28/31

AUTHORS: Zheludev, I.S. and Fridkin, V.M.

TITLE: On Two Limiting Point Symmetry Groups of Polycrystalline Electrets (O dvukh predel'nykh tochechnykh gruppakh simmetrii polikristallicheskikh fotoelektretov)

PERIODICAL: Kristallografiya, 1957, Vol.2, No.5, pp. 705-706 (USSR)

ABSTRACT: A polycrystalline electret specimen of sulphur has earlier been shown to have the symmetry group  $\infty\text{-}\infty\text{-}m$ . (Fridkin, Kristallografiya, Vol.1, 557, 1956). A mixture of asphalt and NaCl dusts have been used for developing the charge pattern on the surfaces of the electrets as by friction the former becomes positively charged and the latter negatively. A specimen with the symmetry group  $m\text{-}\infty\text{-}m$  has now been produced. A layer of polycrystalline sulphur  $50 \mu$  thick was evaporated on to an Al plate in vacuo and was then polarised by a field of  $5 \text{ kV/cm}$  and illuminated at  $5 \times 10^{-6} \text{ W/cm}^2$ . It was then overlaid with a metallic raster with a pattern of  $0.9 \text{ mm}$  diameter holes, polarised in the reverse direction and illuminated at the same intensity for the same time (4 minutes). On dusting with the asphalt and salt powder a pattern became apparent showing a pattern with a non-polar texture of symmetry  $m\text{-}\infty\text{-}m$ . The salt settled on the parts which had been exposed through the holes and the asphalt on the remainder. This texture is non-piezo-electric

Card1/2

70-5-28/31

On Two Limiting Point Symmetry Groups of Polycrystalline Electrets

and non-pyroelectric in contrast to the former with point group  $\infty.m$ . This experiment could be the basis of a two-colour system of electro-photography or xerography. Only the dusting method will show the charge distribution as the total charge on each surface is zero. Acknowledgments to Academician A.V. Shubnikov.

There are 1 figure and 3 Slavic references.

ASSOCIATION: Institute of Crystallography Ac.Sc. USSR.  
(Institut Kristallografi AN SSSR)

SUBMITTED: May 17, 1957.

AVAILABLE: Library of Congress

Card 2/2

Zheludev, I.S.

AUTHOR: Zheludev, I.S.

70-6-4/12

TITLE: The Point Symmetry Groups of Crystals and their Physical Interpretation (Tochechnyye gruppy simmetrii kristallov i ikh fizicheskaya interpretatsiya)

PERIODICAL: Kristallografiya, 1957, Vol.2, No.6, pp. 728 - 733 (USSR).

ABSTRACT: It is shown that the 32 crystallographic point groups can be obtained by scalar, vector and tensor operations on a cube. The hypothesis is put forward that to the different groups obtained in this way but having the same symmetry there correspond differences in the properties of crystals belonging to one and the same symmetry group. An earlier attempt has been made to deduce the point groups from a representation of the geometrical connections between physical properties (Kristallografiya, Vol.2, p.334, 1957). In polar and axial tensor fields of the second rank isotropic media were shown to belong to one of 17 point symmetry groups:-  $\infty/\infty m$ ;  $\infty/\infty$ ;  $m.\infty:m$ ;  $\infty:m$ ;  $\infty:2$ ;  $\infty.m$ ;  $\infty$ ;  $4.m$ ;  $4$ ;  $m.2:m$ ;  $m$ ;  $2:2$ ;  $2:m$ ;  $2$ ;  $\bar{2}$ ;  $1$ . Various mechanical forces such as compression, twisting, etc. may produce fields of these symmetries. The 32 point Card1/2 groups can all be produced by the methods used previously but

70-0-47/1c

The Point Symmetry Groups of Crystals and their Physical Interpretation.

by applying various kinds of field to a cube. For example, a uniform compression, having the symmetry  $\infty\infty.m$  leaves the symmetry of the cube unaffected. A uniform twisting of symmetry  $\infty/\infty$  leads to a new group  $3/4$ . Extending the cube (symmetry  $m.\infty:m$ ) along the 4-fold axis produces the group  $m.4:m$ . Thus the action of a polar tensor along various axes of the cube produces the groups  $6/4$ ,  $m.4:m$ ,  $m.2:m$ ,  $6.m$ ,  $2:m$ ,  $2$  and  $m.6:m$ . Twisting (symmetry  $\infty:2$ ) gives the additional groups  $4:2$ ,  $2:2$ ,  $3:2$ ,  $2$ ,  $1$ . Two perpendicular twists give the group  $4.m$ . A polar tensor (symmetry  $\infty.m$ ) gives the groups  $4.m$ ;  $2.m$ ;  $3.m$ ;  $m$ ;  $1$ . The simultaneous application of a polar vector and an axial tensor give further groups making up the 32. The same group may be obtainable by several different processes and will explain the differences in the physical properties of crystals which have the same point group. Acknowledgments to Academician A.V. Shubnikov. There are 6 figures and 8 references, 6 of which are Slavic.

ASSOCIATION: Institute of Crystallography Ac.Sc. USSR.  
(Institut Kristallografii AN SSSR)

SUBMITTED: August 7, 1957.

AVAILABLE: Library of Congress.  
Card 2/2

AUTHORS:

Zheludev, I.S. and Shuvalov, L.A.

TITLE:

Domain Orientation and Macrosymmetry of Properties  
of Ferroelectric Monocrystals (Orientatsiya domenov  
i makrosimmetriya svoystv segnetoelektricheskikh  
monokristallov)

PERIODICAL:

Izvestiya Akademii Nauk SSSR, Vol. XXI, #2, pp 264-  
274, 1957, USSR, Seriya fizicheskaya

ABSTRACT:

All ferroelectric crystals can be classified into two groups: electrically uni-axial and electrically multi-axial. The electrically uni-axial crystals can have only "longitudinal inversion", i.e., displacement of 180° domain borders. Electrically multi-axial crystals can have, in addition to the longitudinal inversion, also transverse inversion, and some type of multi-axial crystals have several different transverse inversions as well as several longitudinal.

The domain structure, its behavior and a series of the most important properties of ferroelectric monocrystals essentially depend upon the crystal type and its number of spontaneous polarization axes.

Card 1/4

Presented - 1st Conf. on Ferroelectricity, Leningrad 18-24 June 1956

TITLE:

Domain Orientation and Macrosymmetry of Properties  
of Ferroelectric Monocrystals (Orientatsiya domenov  
i makrosimmetriya svoystv segnetoeklektricheskikh  
monokristallov)

This number is determined by the symmetry type of the  
initial non-ferroelectric state.

The conclusion is that the domain orientation and the  
general character of the domain structure are determined  
by the symmetry of a crystal in its initial non- ferro-  
electric phase and by the direction of the initial  
phase along which the spontaneous polarization in the  
ferroelectric phase arises.

The regulated orientation of domains along one or  
several axes of spontaneous polarization leads to the  
fact that a polydomain crystal becomes a polysynthetic  
twin. The elements of twinning are symmetry elements  
which the crystal possessed in the initial non-ferro-  
electric phase, and which are lost during the transition  
into the ferroelectric phase.

Card 2/4

## TITLE:

Domain Orientation and Macrosymmetry of Properties  
of Ferroelectric Monocrystals (Orientatsiya domenov  
i makrosimmetriya svoystv segnetoelektricheskikh  
monokristallov)

In view of the determining role of the initial symmetry, it is possible to establish all possible ferroelectric phase transitions for all crystal classes. The known ferroelectric phase transitions are accompanied by changes of crystal symmetry and transitions into another crystallographic class, shown in Table 1.

It can be stated that each ferroelectric phase transition is accompanied by spontaneous deformation, at the boundaries of the ferroelectric region which leads to a change in the crystal symmetry. The reason of this deformation is piezoeffect and/or electrostriction in connection with spontaneous polarization.

After analysis of all crystallographic classes, the possible ferroelectric phase transitions were compiled as shown in Table 2 of the article. All known transitions are in accordance with Table 2. The table enables one to determine the number of all possible ferroelectric phases.

Card 3/4

TITLE: Domain Orientation and Macrosymmetry of Properties of Ferroelectric Monocrystals (Orientatsiya domenov i makrosimmetriya svoystv segnetoelektricheskikh monokristallov)  
A photographic recording of phase transitions in BaTiO<sub>3</sub>, carried out by the author (12) and investigation of their properties have confirmed the general regularities of domain orientations and their boundaries in polydomain ferroelectric monocrystals, as stated in this article.  
2 Figures and 2 tables are given. The bibliography lists 12 references, 7 of which are Slavic (Russian).

INSTITUTION: Institute of Crystallography of the USSR Academy of Sciences

PRESENTED BY:

SUBMITTED: No date

AVAILABLE: At the Library of Congress.

Card 4/4

APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R002064710010-0

AUTHORS: Zheludev, I.S. and Sit'ko, R.Ya.

TITLE: Character of Change in the Domain Structure of Seignette's Salt in Alternate Elec Fields (Kharakter izmeneniya domennoy struktury segnetovoy soli v peremennykh elektricheskikh polyah).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Vol. XXI, #2, pp 286-288, 1957, USSR, Seriya fizicheskaya

ABSTRACT: In order to clear up the role of domains in the process of re-polarization of ferroelectrics, the domain structure of Seignette's salt was filmed at frequencies of 32 and 1,000 hertz at various intensities of the elec field applied. The filming method used was the conventional one with stroboscopic illumination.  
The photos shown in the article picture the change of domain structure at a frequency of 32 hertz and voltages of 36 and 56 v/cm and a frequency of 1,000 hertz and voltages of 56 and 76 v/cm.

Card 1/2

TITLE:

Character of Change in the Domain Structure of  
Seignette's Salt in Alternate Elec Fields (Kharakter  
izmeneniya domennoy struktury segnetovoy soli v  
peremennykh elektricheskikh polyah).

The most important conclusion drawn from these photos  
is the fact that the domain structure appears dif-  
ferent at equal field voltages depending upon whether  
this field voltage is arrived at by increasing or  
decreasing the field intensity. This phenomenon is  
a manifestation of hysteresis of domain structure  
changes during application of elec fields.

The hysteresis of domain re-orientation is more  
clearly expressed with increase in field intensity.

2 photos are given. 1 Russian reference is listed.

INSTITUTION:

Institute of Crystallography of the USSR Academy of  
Sciences

PRESENTED BY:

SUBMITTED: No date

AVAILABLE: At the Library of Congress

Card 2/2

AUTHORS:

Zheludev, I.S.  
Berkovich, Ye.S., Zheludev, I.S.

32-12-26/71

TITLE:

Use of Linnik Double Microscope for the Determination of the Refraction Index of Barium-Titanate (Primeneniye dvoynogo mikroskopa Linnika dlya opredeleniya pokazatelya prelomleniya titanata bariya).

PERIODICAL:

Zavodskaya Laboratoriya, 1957, Vol. 23, Nr 12, pp. 1456-1458 (USSR)

ABSTRACT:

In the introduction the authors say that such determinations present difficulties in the case of high refraction indices. This is the case also with BaTiO<sub>3</sub>, because its crystal have a refraction index which is near to 2.5. The attempt was therefore made in this work to employ a method already worked out [Ref. 2] for measuring thin, transparent plates, laquer coatings, etc. at a certain refraction index with respect to BaTiO<sub>3</sub> with a corresponding thickness of the plate of the monocrystal. A similar application has already been put into practice [Ref. 3], which differs from the refractometric method only by the fact that in that case the angle formed by the beam and the surface is always 45°. In this case the "MVC-11" double microscope was used. In the course of calculation the conclusion is arrived at that for BaTiO<sub>3</sub> crystals only an average refraction index can be de-

Card 1/2

Use of Linnik Double Microscope  
for the Determination of the Refraction Index of  
Barium-Titanate

32-12-26/71

terminated by this method. In the further course of this work the following new method is suggested: Suitable BaTiO<sub>3</sub> crystals with straight parallel surfaces are selected and measured by means of a micrometer. They are placed upon a sharp-edged well-ground plate in such a manner that they protrude somewhat beyond its edge. On these of their parts they are measured by means of the double microscope with adjustable slit constructed by the Institute for Machine Science AN USSR [Ref 5]. A measuring accuracy of  $1 \pm 0.5$  N or  $\pm 3.7\mu$  is attained.  $10^X$  microobjectives with  $A=0.14$  and an ocular micrometer "AM9-2,15 $X$ " is used for this purpose. (Results are given in a table). If crystals are suitably selected, this method makes it possible to attain the most accurate results. In general, the possible error amounts to  $\sim 2\%$ . There are 2 tables, and 5 Slavio references.

ASSOCIATION: Institute for Machine Science AN USSR and Institute for Crystallography AN USSR (Institut mashinovedeniya Akademii nauk SSSR i Institut kristallografii Akademii nauk SSSR).

AVAILABLE: Library of Congress  
Card 2/2      1. Barium titanate-Refraction index    2. Double microscope-Application

AUTHORS: Fridkin, V. M., Kashukayev, N. T., Zheludev, I.S., 20-117-5-21/54  
TITLE: On the Theory of Photoelectrets (K teorii fotoelektretov).  
PERIODICAL: Doklady AN SSSR, 1957, Vol. 117, Nr 5, pp. 804 - 807 (USSR)  
ABSTRACT: The present paper investigates the explanation of some data obtained at an examination of photoelectrets. At the outset, the kinetic equations for the replenishing of the adhesion levels (urovni prilipaniya) by electrons are given. The problem reduces to the determination of the dependence of the concentration N of the electrons in the adhesion levels on time. If the initial values assumed here are satisfied, the following solution is obtained for the kinetic equations:  $N = N_0(1 - e^{-s_2 Et})$ ,  $N_0 = s_1/s_2$  denoting the concentration of electrons in the steady state,  $s_1$  and  $s_2$  coefficients, which are dependent upon the absorption of light and on the quantum yield, and E denoting the intensity of light. This solution was here determined for the case, that only an insignificant part of the free levels is filled up by electrons by polarisation. The expression given here for the dependence on time of the density of concentration of electrons on the adhesion levels described the saturation effect discovered by V. M. Fridkin (reference 7). According to the experimental curves given here the formula given above describes the exponential character of the dependence of the charge of the photoelectret on the intensity of illumination and on the duration of polarisation quite satisfact-

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On the Theory of Photoelectrets.

20-117-5-21/54

orily. Besides, the rule of interchangeability is satisfied in the case of the production of the photoelectret. Therefore, the charge of the photoelectret is a function of the product  $E \cdot t$  at an arbitrary duration of polarisation  $t$  and at an arbitrary intensity of illumination  $E$ . With the help of the curves attached to the paper this rule of mutual replaceability was verified for a sulphur monocrystal. This rule is complied with at every intensity of illumination employed for the polarisation of the sulphur monocrystal. The theoretical deduction and the experimental verification of the rule of mutuality in photoelectrets are quite independently of interest. The saturation effect mentioned above occurring at the investigation of the dependence of the charge on the duration of polarisation and on the intensity of illumination may be explained by the fact, that only an insignificant part of the free levels is filled up by electrons. This is verified by the experimental investigation of the dependence of the charge of the photoelectret on the intensity of the polarising field. If the temperature effect is taken into consideration, the rule of interchangeability no longer holds. There are 4 figures, 11 references, 10 of which are Slavic.

PRESENTED: July 27, 1957, by A. V. Shubnikov, Academician  
SUBMITTED: July 27, 1957

Card 2/2

ZHELUDEV, I. S.

Zheludev, I. S. and V.M. Fridkin. [Institut kristallografi AN SSSR (Institute of Crystallography, AS USSR)] On the "Photoelectret" [after G. Nadzakov] and "Thermophotoelectret" States of Monocrystalline Sulfur

(The Physics of Dielectrics; Transactions of the All-Union Conference on the Physics of Dielectrics) Moscow, Izd-vo AN SSSR, 1958. 245 p. 3,000 copies printed.

This volume publishes reports presented at the All-Union Conference on the Physics of Dielectrics, held in Dnepropetrovsk in August 1956, sponsored by the "Physics of Dielectrics" Laboratory of the Fizicheskiy institut imeni Lebedeva An SSSR (Physics Institute imeni Lebedev of the AS USSR), and the Electrophysics Department of the Dnepropetrovskiy gosudarstvennyy universitet (Dnepropetrovsk State University).

ZHELUDOV, I.S.

Studying the destruction of rocks during impact load testing  
by means of a piezoelectric meter. Trudy IOEM no. 13:81-90 '58.  
(MIRA 11:?)  
(Petrology)

AUTHORS: Zheludev, I.S. and Fridkin, V.M.

70-3-2-8/26

TITLE: On the Anisotropy of the Polarisation of Photoelectrets  
in Monocrystals of Sulphur (Osn anizotropii poliarizatsii  
fotoelektretov iz monokristallov sery)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 2, pp 182 - 185  
(USSR).

ABSTRACT: The charges of photoelectrets produced in single crystals of sulphur by polarisation in different crystallographic directions have been measured. It was earlier assumed that these crystals were orthorhombic but they are now shown to have been monoclinic. The observed anisotropy in the polarisation of the photoelectrets is determined by the anisotropy in the photo-conduction of the single crystal of sulphur. The measurement of the charges of photoelectrets can serve as a very convenient method of studying the anisotropy of the photoconductivity.

A cube, with edges about 6 mm, was cut from a single crystal of sulphur and polished. Superficially, the crystal was orthorhombic and the cube faces were cut perpendicular to the 2-fold axis. The faces 001 and 001 were perpendicular to the acute bisectrix; 100 and 100 were perpendicular to the obtuse bisectrix and 010 and 010 were parallel to the optic axial

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70-3-2-8/26

On the Anisotropy of the Polarisation of Photoelectrets in Mono-crystals of Sulphur.

plane. The cube was polarised for 10 minutes, in a field of 700 V/cm and in an illumination of  $10^{-4}$  W/cm<sup>2</sup>. This was repeated in each of the 6 cube axis directions and the electret charges were measured by measuring the change in charge when, under continued illumination the electrets were de-polarised. The values found were ( $\times 10^{-10}$  Coulomb/cm<sup>2</sup>); 010, 95; 010, 60; 100, 1.50; 100, 1.47; 001, 44; 001, 20. To eliminate the effects of cracks, the above measurements were repeated with three other specimens. To eliminate the effects of anisotropy in the light absorption the charges were re-measured with Nadjakoff's volume method (Izv. Bulg. Akad. Nauk., Ser. Fiz., Vol 2, pp 321-337, 1951). One of the specimens was placed between the plates of a condenser, one of the plates of which was fixed and connected to the needle of an electrometer and the other plate (the lower) was earthed and being movable could be lowered a known distance. As a result of the motion of the lower electrode with the electret the needle of the electrometer was deflected and the surface charge of the photoelectret could be measured. The condenser was constructed so that the specimen could be illuminated during polarisation in a direction

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On the Anisotropy of the Polarisation of Photoelectrets in Mono-  
crystals of Sulphur

70-3-2-8/26

perpendicular to that in which it was being polarised. Hence, for each direction of polarisation there were two independent directions in which the crystal could be illuminated. Specimens were polarised with 1.3 kV/cm for 10 min. with an illumination of  $10^{-4}$  W/cm<sup>2</sup>. The values for the charge density (in Coulombs  $\times 10^{-10}$  per cm<sup>2</sup>) were as follows: indices of illuminated face first, then direction of polarisation, then charge density) 001, 010, 28; 001, 010, 18; 010, 010, 31; 010, 010, 19; 001, 100, 40; 001, 100, 38; 100, 100, 42; 100, 100, 39; 100, 001, 12; 100, 001, 5; 010, 001, 12; 010, 001, 5. It is apparent that the charge density depends only on the direction of the polarising field and not on the density of the incident illumination. Hence, the anisotropy must be due to the anisotropy of photoconductivity. It is then found by Neumann's principle, that the crystal class must be m (monoclinic) with the plane of symmetry perpendicular to the obtuse bisectrix. Acknowledgments to Academician Shubnikov. There are 2 tables and 6 references, 5 of which are Soviet and 1 German.

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On the Anisotropy of the Polarisation of Photoelectrets in Mono-  
crystals of Sulphur 70-3-2-8/26

ASSOCIATION: Institut kristallografii AN SSSR  
(Institute of Crystallography Ac.Sc. USSR)  
SUBMITTED: July 29, 1957.  
Card 4/4

AUTHORS: Zheludev, I.S. and Fotchenkov, A.A. 70-3-3-9/36

TITLE: The Electrostriction of Linear Dielectrics (Elektrostriktiya lineynykh dielektrikov)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 3, pp 308 - 314  
(USSR).

ABSTRACT: Four possible equations for the electrostriction of linear dielectrics are derived and lead to the examination of the new coefficients  $R_{ijmn}$ ,  $G_{ijmn}$  written C erroneously in one place) and  $H_{ijmn}$ . By the method of linearisation of electrostriction the electrostriction coefficients  $R_{ijmn}$  were measured for eskapon (GASH), NaCl and Z-cut quartz. In a non-piezo-electric dielectric the equations used are

$$r_{ij} = Q_{ijmn} d_m d_n / t_{ij} = 0, \quad t_{ij} = -H_{ijmn} E_m E_n / r_{ij} = 0,$$

$$r_{ij} = -R_{ijmn} E_m E_n / t_{ij} = 0 \quad \text{and} \quad t_{ij} = G_{ijmn} d_m d_n / r_{ij} = 0.$$

$d_m$  is the induced electric induction,  $E_m$  is the electric

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## The Electrostriction of Linear Dielectrics

70-3-3-9/36

field,  $r_{ij}$  the mechanical deformation and  $t_{ij}$  the mechanical stress.  $Q$ ,  $H$ ,  $R$  and  $G$  can be expressed as derivatives, as:  $Q_{ijmn} = -1/2 \frac{\partial^4 E_m}{\partial t_{ij} \partial d_n}$ , etc.

Relations can also be found between the various electrostriction coefficients in terms of, for example, the dielectric susceptibility measured at constant stress, compliance for constant  $E$  and  $D$ , etc. The electrostriction tensor has 21 components and Laval's theory is not applied here. The notation is condensed by denoting  $E_1 E_1$  by  $E_1$  etc.  $E_2 E_3$  by  $E_4$ ,  $E_3 E_1$  by  $E_5$ ,  $E_1 E_2$  by  $E_6$ . This tensor is quite analogous to the compliance tensor  $s_{ij}$ . The apparatus used for measurements has been described (Kristallografiya, 1957, Vol 2, Nr 5, pp 653 - 657) and works on the principle of modulation interferometry permitting the measurement of displacements to 0.05A.

Card 2/3 For Z-cut quartz  $R_{33}$  was found to be  $(0.1 \pm 0.05) \times 10^{-14}$  cgsu.

## The Electrostriction of Linear Dielectrics

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$$\text{for GASH } R_{11}=R_{22}=R_{33} = (0.8 \pm 0.05) \times 10^{-14} \text{ cgsu}$$

$$R_{12}=R_{13}=R_{23} = -(0.4 \pm 0.05) \times 10^{-14} \text{ cgsu}$$

$$R_{44}=R_{11}=R_{12} = (1.2 \pm 0.05) \times 10^{-14} \text{ cgsu}$$

$$\text{For NaCl } R_{11}=R_{22}=R_{33} = (0.9 \pm 0.05) \times 10^{-14} \text{ cgsu}$$

$$R_{12}=R_{13}=R_{23} = -(0.45 \pm 0.05) \times 10^{-14} \text{ cgsu}$$

$$R_{44} = (0.3 \pm 0.05) \times 10^{-14} \text{ cgsu}$$

Acknowledgments to A.V. Shubnikov.

There are 6 figures and 13 references, 4 of which are  
Soviet and 7 English, 2 French.ASSOCIATION: Institut kristallografii AN SSSR  
(Institute of Crystallography, Ac.Sc.USSR)

SUBMITTED: March 14, 1958

Card 3/3

AUTHORS: Zheludev, I.S. and Fridkin, V.M. 70-3-3-10/36

TITLE: The Piezo-electric Effect in Photo-electrets (P'yezo-elektricheskiy effekt v fotoelektretakh )

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 3, pp 315 - 321  
(USSR).

ABSTRACT: Piezo-electric effects in photo-electrets have been detected and measured. The charges and the piezoelectric moduli of a photo-polarised crystal of anthracene have been measured and the decay of the charge and the  $d_{33}$  modulus during de-polarisation in the dark have been followed. The effects can be completely explained by the changes in the electric polarisation as a result of the changes in the geometrical dimensions of the specimen on mechanical strain. When the crystal becomes a photoelectret, its symmetry drops to become one of the sub-groups of C<sub>2h</sub>. The case of crystals of Class 2 is examined. Here, the piezo-electric moduli  $d_{14}$ ,  $d_{15}$ ,  $d_{24}$ ,  $d_{25}$ ,  $d_{31}$ ,  $d_{32}$ ,  $d_{33}$  and  $d_{36}$  are non-zero and relate the polarisation vector  $I_i$  to the strain tensor  $t_{ik}$ .  $s_{ik}$  are the elastic moduli and  $r_{ik}$  is the deformation tensor.  $S$  is the charge density on the surface of the photoelectret. For a cube polarised parallel to its  $X_3$ .

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The Piezo-electric Effect in Photo-electrets

70-3-3-10/36

axis and distorted along the same axis  $t_{33} \neq 0$ ,  
 $I_3 = d_{33} t_{33}$ ,  $r_{11} = s_{13} t_{33}$ ,  $r_{22} = s_{23} t_{33}$ ,  $r_{33} = s_{33} t_{33}$  so  
that  $d_{33} = S(s_{33} - s_{23} - s_{13})$ . If  $t_{11} \neq 0$  and  $t_{22} \neq 0$   
then  $d_{31} = S(s_{13} - s_{11} - s_{12})$  and  $d_{32} = S(s_{23} - s_{12} - s_{22})$ .  
For a 10 mm cube of anthracene the values  $d_{33} = 4.7 \times 10^{-9}$   
e.s.u.,  $d_{31} = -2.5 \times 10^{-9}$  e.s.u.,  $d_{32} = -2.2 \times 10^{-9}$  e.s.u.  
and  $S = 6 \times 10^{-7}$  coul./cm<sup>2</sup>. Values for the elastic  
modulus  $s_{33}$  from measurements of the piezo-electric  
modulus  $d_{33}$  and from the known value of  $c_{33}$  agree to  
about 10%.

Acknowledgments to Academician A.V. Shubnikov.  
There are 2 figures and 11 references, 6 of which are  
Soviet, 3 English, 1 French and 1 German.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of  
Crystallography, Ac.Sc. USSR)

SUBMITTED: July 20, 1957.  
Card 2/2

AUTHORS: Zheludev, I.S. and Vlokh, O.G. SOV/70-3-5-24/24  
TITLE: The Electro-optical Effect in Crystals (Elektroopticheskiy effekt v kristallakh)  
PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 5, pp 639-651 (USSR)  
ABSTRACT: General review, mostly of non-Russian work, of electro-optical phenomena in crystals - a theme now under investigation in the USSR.  
There are 9 figures, 2 tables and 41 references, 7 Soviet, 6 German and 28 English.  
ASSOCIATION: Institut kristallografi AN SSSR  
(Institute of Crystallography of the Ac.Sc.USSR)  
SUBMITTED: July 11, 1958

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USCOMM-DC-60487

SOV/70-3-6-23/25

AUTHORS: Belyayev, L.M., Belikova, G.S., Fridkin, V.M. and  
Zheludev, I.S.

TITLE: On the Question of the Electret State in Naphthalene  
(K voprosu ob elektretnom sostoyanii v naftaline)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 6, pp 762-763 (USSR)

ABSTRACT: Baldus (Z. Angew.Phys., 1954, Vol 6, p 481) reported observing the transformation of hetero-charging in a naphthalene electret into homo-charging. This result contradicts other work and experiments were carried out to clarify the situation. Liquid naphthalene was allowed to set in an electric field between two Al plates 5 mm apart. The field of 4kV/cm was applied for 90 minutes. The naphthalene plate was removed from the condenser and tested with a dynamic electrometer. Heterocharging was found. Discharging by illumination was then tried. Integration of the discharge current gave an initial charge of  $10^{-8}$  coulomb/cm<sup>2</sup>. Repeated illumination gave no further discharge current. Hence the heterocharging is conditioned by localised electrons. Plates cut from single crystals of naphthalene were then tried. They were subjected to a field of 3 kV/cm for 10 min with U/V

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On the Question of the Electret State in Naphthalene  
SOV/70-3-6-23/25

illumination. The charge density produced was about  $10^{-10}$  coulomb/cm<sup>2</sup>. A similar charge density could be produced by polarising in the dark. This shows that a sharp distinction cannot be drawn between the photoelectret and thermoelectret states in naphthalene and that both these phenomena are controlled by the same mechanism. There are 5 references, 2 of which are Soviet, 2 English and 1 German.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography of the Ac.Sc.USSR)

SUBMITTED: June 28, 1958

Card 2/2

AUTHORS: Zheludev, I. S., Fridkin, V. M. 48-22-3-28/30

TITLE: On the Photoelectret and Thermoelectret State in Sulfur  
Monocrystals (O fotoelektretnom i termoelekretnom  
sostoyaniyakh v monokristallakh sery)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1958,  
Vol. 22, Nr 3, pp. 352-358 (USSR)

ABSTRACT: The authors investigated the dependence of the charge of the photoelectret on the conditions of its polarization as well as the duration of existence of the residual polarization in the monocrystals of sulfur. They investigated the dependence of the depolarization velocity on the temperature and introduced the conception of a thermoelectret state. The duration of existence of the inner polarization was investigated in the monocrystalline and polycrystalline sulfur. A depolarization ought to be carried out after a sufficiently long period for the determination of the amount of photopolarization of the polycrystalline sulfur with a short-time illumination during the polarization process (ref. 2). The dark polarization disappears completely during this period and the photo-polarization is preserved. Nevertheless, this method seems to

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On the Photoelectret and Thermoelectret State in Sulfur  
Monocrystals

48-22-3-28/30

be unfit with the polarization of the sulfur crystals since the total residual polarization drops to zero in this case. From the comparison of the curves (figs. 4 and 2) it may be concluded that the law of mutual substitution in the crystal is not complied with with the formation of an inner polarization. This signifies that with one and the same E. r.-value the amount of the residual polarization depends on the duration of illumination. The velocity of depolarization of the sulfur-monocrystal was investigated at different temperatures. The depolarization-curves of the photoelectret which were determined, are analogous to the depolarization curves of the thermo-electrets in the case of simultaneous illumination and heating (e.g. ref. 5). The photoelectret state of the sample is also thermoelectret at the same time under the conditions described, since the illumination of the photoelectret at low temperatures leads only to a partial discharge. A complete depolarization only takes place at an increase in temperature up to the temperature prevailing at its polarization. This state of the sulfur-sample is at the same time also thermoelectret, since a simultaneous

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On the Photoelectret and Thermolectret State in Sulfur Monocrystals 49-22-3-28/30

heating and illumination is required for the complete depolarization. This state can consequently be denoted as thermo-photo-electret. The thermo-photo-electret state in the sulfur-monocrystal is apparently caused on the one hand by the fastening of the ions on some local levels and on the other hand by the presence of a thermal barrier. This barrier separates the level of excitation from the zone of conductivity. The mechanism which was proposed for the explanation of the temperature-dependence of the photo-conductivity in alkaline-halogen crystals (ref. 7), is apparently able to explain the thermo-photoelectret effect and consequently also the formation of the maximum of transition of the discharge-current during the depolarization process of the photo-electrets with simultaneous illumination and heating. The authors thank A. V. Shubnikov, Member, Academy of Sciences, and G. Nazhdakov, Member of the Bulgarian Academy of Sciences for the discussion of the work-results as well as Yu. N. Martyshev and A. I. Delovaya for their assistance in carrying out the measurements. There are 5 figures and 7 references, 4 of which are Soviet.

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3

24(3), 24(2)

AUTHORS:

Zheludev, I. S., Sonin, A. S.

SOV/48-22-12-7/33

TITLE:

On the Question of the Search for New Piezoelectrics (K voprosu  
o poiske novykh segnetoelektrikov)

PERIODICAL:

Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1958,  
Vol 22, Nr 12, pp 1441 - 1444 (USSR)

ABSTRACT:

The search for new materials possessing piezoelectric properties is of topical interest for both science and technique. New piezoelectrics can only be found on the basis of essential characteristics marking the formation conditions of spontaneous polarization in the crystal. These characteristics are ascertained basing on the analysis of characteristic properties of known piezoelectrics. The existence of a domain structure can be considered as an essential characteristic feature. The phase transitions of the first or second type are also an important characteristic of piezoelectric properties. Piezoelectrics of the oxygen-octahedron type and those containing hydrogen compounds present other characteristic features. Smolenskiy-Mattias' crystallo-chemical characteristic

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On the Question of the Search for New Piezoelectrics 80V/48-22-12-7/33

(Refs 9,10) is regarded as belonging to the first type. Piezoelectrics containing hydrogen, make the problem more complicated. Here it is much more difficult to formulate the characteristics, because the mechanism leading to the formation of spontaneous polarization is very unclear (Ref 11). The chemical composition and its structure are moreover extremely complicated and varied. It was already earlier mentioned (Ref 13) that the symmetry variation of all piezoelectrics hitherto known which takes place during the phase transitions, is subject to certain rules. Symmetry variations of a few piezoelectrics during their phase transitions are given in table 1. This table is a supplement of the published data. (Ref 13). The conclusion has been drawn that a variation of point symmetry, belonging to one of the pyroelectric classes, can be held as a characteristic of piezoelectric phase transitions for all dielectrics. This characteristic is called the crystallographic feature of spontaneous polarization. Such materials were chosen in this work for which the variation of symmetry at phase transitions was known to be subject to the crystallographic characteristic (Table 2). In conclusion it is pointed out, however, that the mentioned characteristics

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On the Question of the Search for New Piezoelectrics      SOV/48-22-12-7/33

are indeed necessary, but not sufficient. The search for new piezoelectrics is facilitated by them, but neither shortened nor theoretically completely substantiated. The next paper, therefore, will be dedicated to the investigating of piezoelectric properties of the materials recorded in table 2, as well as to the determination of optimum conditions of existence for spontaneous polarization in crystals. The authors thank L. Z. Rusakov, I. S. Rez, V. V. Gladkov for their assistance. There are 2 tables and 13 references, 4 of which are Soviet.

ASSOCIATION: Institut kristallografii Akademii nauk SSSR (Institute of Crystallography, Academy of Sciences USSR) TsNIP Komiteta po radioelektronike Soveta Ministrov SSSR (TsNIP of the Committee of Radioelectronics, Cabinet Council USSR)

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